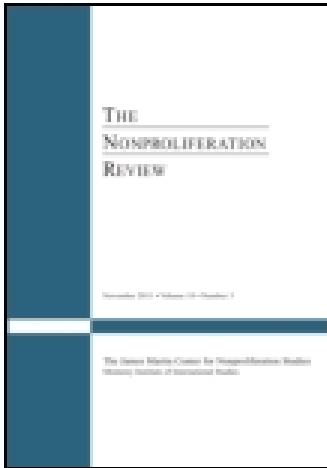


This article was downloaded by: [Columbia University]

On: 17 December 2014, At: 05:23

Publisher: Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



## The Nonproliferation Review

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/rnpr20>

### Economic Competition and Nuclear Cooperation

Jeffrey S. Lantis

Published online: 18 Feb 2014.



CrossMark

[Click for updates](#)

To cite this article: Jeffrey S. Lantis (2014) Economic Competition and Nuclear Cooperation, The Nonproliferation Review, 21:1, 21-41, DOI: [10.1080/10736700.2014.880277](https://doi.org/10.1080/10736700.2014.880277)

To link to this article: <http://dx.doi.org/10.1080/10736700.2014.880277>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms &

Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

# ECONOMIC COMPETITION AND NUCLEAR COOPERATION

## The “Nuclear Renaissance” Revisited

Jeffrey S. Lantis

*The number of bilateral nuclear cooperation agreements surged during the “nuclear renaissance” of the past decade. This proliferation is only partially explained by the prevailing approaches that focus on strategic imperatives. To supplement these explanations, this study draws on neoliberal models of economic competition to posit that bilateral agreement negotiations also exhibit conditions of “uncoordinated interdependence” and maneuvering to gain market share. Case evidence suggests the contours of supplier state bids for civilian assistance are determined at least as much by considerations about economic competition as they are by positive strategic goals. In addition, this study identifies several cases of cooperation where there appears to be little or no strategic motive for export agreements. The study concludes that patterns of economic competition and the influence of peers in defined competitive spaces alter material payoffs and impact policies. It also identifies a surprising role for principled restraint in dampening strategic and economic competition in some dyads.*

KEYWORDS: Nuclear energy; Vietnam; Jordan; nuclear cooperation; Japan; Russia

The United States and other advanced industrialized states have negotiated bilateral nuclear cooperation agreements (NCAs) with client states since the 1950s. These agreements are political and legal frameworks for sharing civilian nuclear energy technology, including plant designs, construction, scientific data and training, and even enriched uranium fuel for reactors. The number of nuclear suppliers, client states, and NCAs increased significantly during the Cold War, and a new burst of deal-making occurred with the “nuclear renaissance” of the past decade. By 2013, nearly 2,300 NCAs had been completed worldwide, and scores of new states have expressed interest in nuclear power. Advanced industrialized states such as the United States, Russia, and Japan, plus European consortia, are actively competing for contracts to supply nuclear technologies to new clients.

Politicians and corporate executives tout these developments as a healthy sign of globalization, but a new wave of security studies has critically examined motivations behind the nuclear renaissance and its potential to enable weapon proliferation. Recent studies argue that peaceful NCAs developed from 1950 to 2000 actually increased the likelihood that client states would pursue and acquire nuclear weapons.<sup>1</sup> Addressing the

puzzle of why supplier states would ever provide assistance that might be diverted for clandestine nuclear weapon programs, scholars find primary drivers in the strategic imperatives of supply decisions, including prevailing concerns about imbalances of power, enmity, and the desire to assist allies facing regional insecurity. Even where suppliers understood they might inadvertently contribute to weapon proliferation, some were willing to accept such risks when they received “offsetting political and strategic benefits.”<sup>2</sup> This work directed needed attention to some of the dynamics behind nuclear supply and offered new, empirical avenues for proliferation studies.

However, this study contends the strategic imperatives literature provides only a partial explanation of NCA development in the nuclear renaissance, as well as their most important consequences. While strategic models are compelling, they tend to miss critical dynamics of economic competition in the global marketplace. Cross-sectional examination of data on NCA growth patterns shows they tend to develop in clusters around client states, when governments and corporations alike scramble to negotiate and sign lucrative deals. A bilateral NCA can spawn dozens of additional agreements related to dimensions of nuclear cooperation, including joint research projects, enrichment, reprocessing, and the storage of nuclear waste.<sup>3</sup> The nuclear renaissance of the past decade appears to have fostered an intense, competitive nuclear marketplace.

This article proceeds by first reviewing scholarship on nuclear energy cooperation, and then draws on insights from diffusion theory to highlight the contagion effects of competition from a supply-side perspective. It conducts a plausibility probe of propositions derived from the strategic and economic competition models through six cases of nuclear cooperation dyads. Comparative case studies show that the contours of supplier state offers for civilian assistance to potential recipients are determined at least as much, and sometimes more so, by considerations about economic competition as they are by any positive strategic goals. Economic competition also may foster cooperation where it might otherwise not have existed; and in select cases, principled restraint appears to play a significant intervening role. The study affirms the value of a mixed motives model of nuclear transfers and concludes with broader lessons for theoretical models of international cooperation.

### Strategic Imperatives

Peaceful nuclear energy cooperation traditionally has received far less attention in the security studies literature than the spread of nuclear weapons and the shadow they cast over global politics. Noted international relations theorist Kenneth N. Waltz and his cohorts employed rational deterrence theory to explain a state’s drive for nuclear weapons and the impact of proliferation on the international system during the Cold War. Nuclear weapon development was framed as a rational response to maximize security in an anarchic system. Early studies of nuclear proliferation tended to focus on the “demand-side” of the problem, with particular attention to structural factors that lead states to pursue nuclear weapons.<sup>4</sup> Subsequent work widened the lens to explore domestic determinants behind proliferation, including technological capability, political institutions, and the psychology of leaders.<sup>5</sup>

Over the past decade, an impressive new wave of scholarship has emerged that draws nuclear energy policies into mainstream security studies. For example, one study of weapon proliferation examines internal incentives (regime type and liberalization-related incentives) and external incentives (security threats and guarantees), and concludes that both enduring rivalries and militarized disputes are important determinants of the drive for weapons.<sup>6</sup> New quantitative work also explores questions of supply-side motivations behind exports of nuclear energy assistance. Georgetown University's Matthew Kroenig offers a strategic theory focused on power dynamics between suppliers and clients as well as the goal of imposing strategic costs on rivals. Matthew Fuhrmann of Texas A&M University argues there are three strategic reasons why states provide civil nuclear assistance: to strengthen allies, to build relationships with enemies of enemies, and "to strengthen existing democracies and bilateral relationships with these countries."<sup>7</sup> This suggests a provocative blurring of the line between understanding the determinants behind weapon proliferation and the pursuit of peaceful nuclear energy.

Another compelling line Kroenig explores is whether the spread of nuclear weapons ultimately causes more problems for powerful states (superpowers in particular) than for weaker states. Building on assumptions of the deterrence literature, Kroenig predicts superpowers will be less likely than regional powers to provide sensitive nuclear assistance that might result in nuclear weapon proliferation. While Kroenig's focus is purely on instances of sensitive nuclear transfers—defined as "the state-sponsored transfer of the key materials and technologies necessary for the construction of a nuclear weapons arsenal to a nonnuclear weapon state" (such as nuclear weapon designs or assistance in construction of plutonium reprocessing plants to produce fissile material for weapons)—this argument nevertheless raises interesting questions about the impact of power differentials on export policy decisions.<sup>8</sup>

These studies also explore the potentially dire results of nuclear energy technology sharing. Authors highlight case studies of nuclear weapon proliferation by Pakistan, India, Israel, and other states. Kroenig finds a strong correlation between cases of sensitive nuclear technology assistance and development of nuclear weapons.<sup>9</sup> Fuhrmann takes this a step further, arguing "[a]ll types of civilian nuclear assistance raise the risks of proliferation. Peaceful nuclear cooperation and proliferation are causally connected because of the dual-use nature of nuclear technology and know-how."<sup>10</sup> Scholars conclude that even "legal nuclear commerce conducted under the auspices of the NPT [Treaty on the Non-Proliferation of Nuclear Weapons] can have damaging effects for national and international security."<sup>11</sup>

For the purposes of this article, strategic importance is defined by strong bilateral relationships that typically include some form of military cooperation (e.g., alliances, basing, joint operations) as well as broader geopolitical ties. According to this long strategic view, there would be a tendency for strategic partners to form a homogenous set of relationships based on predictable patterns of interaction. This suggests the following proposition for study:

*Proposition 1: Supplier states are more likely to complete bilateral nuclear cooperation agreements and provide generous terms for civil nuclear assistance to "strategic partners"—clients with whom there is an established relationship—and deals that offer broad strategic*

*gains (e.g., to strengthen their allies, to strengthen their relationship with enemies of enemies, or to strengthen existing democracies).*

Dynamics between strategic partners should be clearly evidenced in discrete cases of NCA negotiations. We expect to observe that supplier states with vested geostrategic interests in, and standing relationships with, potential clients would be most likely to actively negotiate and complete nuclear cooperation agreements. One should see evidence of the desire to strengthen alliances, counterbalance against shared adversaries, and/or promote democracies in the context of nuclear cooperation.

While strategic models offer valuable insights into the role of power and regional rivalries in influencing nuclear technology transfer decisions, this literature also has limitations. A focus on strategic imperatives tends to generalize what may be more discrete and complex developments in nuclear cooperation. Supply-side empirical studies also tend to discount the importance of economic and domestic political factors in shaping nuclear cooperation agreements. While Kroenig recognizes economics may be a challenge to his strategic arguments, his work explores only one subset of the literature focused on the “profit motive”—arguments that less developed, economically struggling states might be more likely to provide sensitive nuclear assistance for profit—and concludes these arguments are not supported by the data.<sup>12</sup> Finally, past scholarship also does not address the question of how and why governments change their nuclear cooperation policies in relation to international norms.

### **Economic Competition**

This article employs an alternative model to explore how different factors may motivate states to supply nuclear energy materials or technologies, as well as the process by which this occurs. Here, economic competition is expected to spark significant exchanges between governments in bilateral relationships, but also among corporations to gain market share.

Neoliberal dynamics have been examined in recent studies of nuclear weapon proliferation. For example, Etel Solingen at the University of California, Irvine, and McGill University’s T.V. Paul suggest leaders who are more oriented to economic growth through engagement with the global marketplace take decisions that, by and large, rein in propensities to nuclearization. Thus, the key to understanding state motivation regarding nuclear weapons is whether they have lower tariff barriers to trade and are open to global capital, investments, and technology. Economic interdependence may drive a state to focus on negotiating bilateral and multilateral arrangements in order to mitigate security dilemmas and enhance information about others’ intentions.<sup>13</sup> Fuhrmann also conducts a test of contagion effects in his empirical work on the demand side of nuclear cooperation, finding that states are substantially more likely to sign NCAs that entitle them to assistance when their neighbors do so.<sup>14</sup>

A focus on economic competition is also informed by diffusion theory, which offers a fascinating window into mechanisms of interstate cooperation or competition. Diffusion occurs when “the prior adoption of a trait or practice in a population alters the probability

of adoption for remaining non-adopters.”<sup>15</sup> The theory has flourished in recent decades, with foundational work in the fields of medicine and sociology/anthropology exploring “the process of adopting or borrowing by one culture from another various devices, implements, institutions, and beliefs.”<sup>16</sup> Political scientists have drawn insights from these foundations for the study of public health, race riots, and international financial crises.<sup>17</sup> The primary assertion of diffusion theory is that policy choices are interdependent. The reality that states do not constitute independent agents is termed “Galton’s problem” in comparative politics.<sup>18</sup> Frank Dobbin and Beth Simmons of Harvard University, along with Geoffrey Garrett of the Pacific Council on International Policy, contend diffusion models address this problem by challenging the conventional *modus operandi* in political science of explaining policy outcomes as domestic responses to common external shocks.<sup>19</sup> Policy development is understood more fully as interdependent—where the choices of various actors influence other actors.<sup>20</sup>

In political science, diffusion studies have primarily been employed in neoliberal studies of international political economy and comparative politics. While traditional studies in international political economy tend to reduce “external influences” to simple exogenous factors, more contemporary works allow the possibility of interdependent decision making between external and internal factors, and between multiple governments.<sup>21</sup> For example, Simmons and Zachary Elkins at the University of Texas at Austin identify clusters of economic liberalization in particular time periods and regions, as “waves” that can only be explained using policy diffusion models.<sup>22</sup> Government responses are influenced by both the actors and conditions inside their countries, as well as the policies of other countries. They conclude, “the most pronounced effect on policy transition comes from economic competition ... [g]overnments clearly tend to liberalize when their competitors do.”<sup>23</sup>

This study adopts an economic competition model to highlight dynamics associated with nuclear export policies and nuclear cooperation agreements. Specifically, it posits that a government’s decision to pursue policy innovation related to nuclear exports is influenced by actions of other states. The contours of supplier state offers for civilian assistance to potential recipients are determined at least as much, and sometimes more so, by considerations about economic competition as they are by any positive strategic goals. This may include a competitive “‘race to the bottom’ as countries slash taxes, social spending and environmental and labor regulations to win over investors and export markets.”<sup>24</sup> Competition models also tell us that those players who are most impacted should be most sensitive to policies of their peers. This sees policy development as a function of state actions in a competitive space (temporal or local). The next step is to demonstrate that changes in the policies of the members of a competitive network increase the probability of similar changes in other states. A state’s actions generate externalities for others, thereby creating an incentive to respond in kind. One might expect a path of macroeconomic convergence to a lowest common denominator, such as in international trade and finance.

For the purposes of this article, economic competition is defined as rivalry and interactive exchange over competitive bids for nuclear infrastructure, technology, or materials. This suggests the following proposition for study:

*Proposition 2: Supplier states are more likely to complete bilateral nuclear cooperation agreements and provide generous terms for civil nuclear assistance when they face direct economic competition for a potential client (e.g., driven by short-term gains, regardless of the presence or absence of strategic imperatives).*

Evidence of these dynamics at work should be visible in the temporal ordering of negotiations for technology sharing, the nature of nuclear cooperation under negotiation, and the choice of potential partners. We would expect to observe that once a major supplier signs a Memorandum of Understanding (MOU) for negotiation of a nuclear cooperation agreement, other supplier states will attempt to negotiate agreements. Suppliers will also compete in offering more advantageous terms to heighten their competitiveness and win bids for plant construction, technology sharing, or materials supply. Negotiations are likely driven by expectation of short-term benefits through gaining market share in competition; one may see evidence in immediate, short-term pivots in negotiating stances for nuclear cooperation. Active nuclear cooperation policies that spread through competition may be more “selective” than strategic (i.e., the pattern of counterpart choice and rule-making should reflect the desire to create or restore competitive advantage) and heterogeneous. In sum, this proposition sets out to address an important, yet often overlooked dynamic that may impact peaceful nuclear assistance.

## Methodology

This article employs the comparative case study approach to probe the impact of strategic imperatives as well as the *process* by which competitive dynamics of diffusion influence NCA negotiations. It examines policies and discourses in competitive nuclear technology sharing arenas.<sup>25</sup> This qualitative methodology captures the less easily quantifiable signs of competition, such as government policy preference formation coupled with intense industry rivalries, which are not addressed by aggregate levels of economic exchange.<sup>26</sup>

Case studies examine the activities of three key supplier states—the United States, Japan, and Russia—within two developing markets: Jordan and Vietnam.<sup>27</sup> All three suppliers have been actively engaged in securing civilian NCAs and providing technologies for energy production. They are all signatories of the NPT, members of the Nuclear Suppliers Group and major multilateral institutions, and provide a wide range of technologies and expertise in the market. As NPT state parties, though, they practice restraint in the types of materials transferred and adhere to the ban on exports of nuclear explosive devices or research and development of a nuclear explosive device for any other military purpose.<sup>28</sup> Notably, each has also suffered major nuclear accidents that have impacted their civil nuclear energy programs, affected their nuclear commerce abroad, and provided valuable lessons for their contemporary nuclear operations. The selection of client states, Vietnam and Jordan, was driven by several factors. These are ongoing cases and have contemporary policy relevance. They also represent developing states in two different regions of the world, suggesting the potential for generalizability beyond specific regional security dynamics. Other criteria for case selection include expectations of variance across the design and availability of information on what are often secret, high-stakes deliberations.<sup>29</sup>



## The Hashemite Kingdom of Jordan and Nuclear Power

King Abdullah II ibn Al-Hussein announced his country's intention to develop a civilian nuclear power program in January 2007. At the time, Jordan was importing 96 percent of its electricity from other countries, at the cost of billions of dollars per year. The government saw nuclear power as a route to energy security, to provide electricity for desalination plants, and further economic and scientific development.<sup>30</sup> Jordan joined nearly a dozen states in the Middle East, including Turkey, Algeria, Morocco, Egypt, Bahrain, Oman, Qatar, and Saudi Arabia, in expressing interest in the nuclear renaissance.

Jordan established a Committee for Nuclear Strategy and opened talks with a variety of supplier states regarding construction of a nuclear reactor and supporting infrastructure. The government's stated goal was to build a 1,100 megawatt (MW) reactor, the first in a series of plants that would allow the country to produce a substantial portion of its own electricity. The discovery of more than 100,000 tons of uranium ore in Jordan (the tenth largest deposit in the world) spurred on hope of true energy independence.<sup>31</sup> Jordan also established an Atomic Energy Commission (JAEC) in 2007 that would oversee aspects of the enterprise, including a focus on safety and environmental issues, and surveyed site options for nuclear plants. A longtime supporter of the NPT, Jordan further sought to demonstrate its good intentions by signing the International Atomic Energy Agency (IAEA)'s Additional Protocol, a controversial agreement that grants broader access to international inspections than those outlined in the NPT.<sup>32</sup>

### *Strategic Imperatives*

Strategic motives appear to offer an explanation of early US engagement with Jordan on the nuclear question. Once the United States learned of Jordan's interest in nuclear power in 2007, diplomats moved quickly to sign a MOU. This action seemed a natural extension of existing ties between the two states. Jordan is a major non-NATO ally of the United States, and it is one of the few Arab nations that cooperates extensively with both the United States and Israel. In 2000, the United States rewarded Jordan with an expedited process of negotiation (and ratification) of a bilateral free trade agreement.<sup>33</sup> Seven years later, officials clearly believed nuclear cooperation would strengthen bilateral ties.<sup>34</sup>

However, strategic imperatives fail to account for subsequent negotiation delays, unfavorable terms, and (at this writing) the absence of a completed NCA between the two nations. A partial explanation may be found in the backdrop of a broader initiative by the Barack Obama administration to insist on a new standard for NCAs in the Middle East. In its first-of-a-kind 2009 agreement with the United Arab Emirates (UAE), the United States secured a pledge that the UAE forsake any plans for uranium enrichment or reprocessing in exchange for nuclear technology sharing. This was an extension of the George W. Bush administration's policy to embed such clauses in MOUs with potential nuclear partners throughout the region during the nuclear renaissance, including with Jordan. The Obama administration hailed the achievement of the UAE deal as a new "gold standard" for future civilian cooperation deals. Notably, though, the agreement had an opt-out clause—if any state in the region received a better or more lenient deal than the UAE, the UAE could re-

open and renegotiate its deal with the United States—which raised the bar for US nuclear cooperation with all other states in the region.

From 2007 to 2011, the US position in negotiations was firm: any NCA with a state in the Middle East was contingent on a no-enrichment clause. But this appeared to be untenable for a deal with Jordan. The Kingdom insisted that it retain the right to engage in uranium enrichment in the future if it chose (a position strengthened with its discovery of a large reserve of indigenous uranium), and it rejected any restrictions on future development of its nuclear fuel cycle on principle, as a violation of sovereignty and Article IV rights under the NPT.<sup>35</sup> By 2011, the White House seemed caught in a strategic dilemma: If it demanded that clients like Jordan accept the gold standard restrictions, it risked losing lucrative deals to partners who would simply turn to suppliers with no such requirements. On the other hand, if the administration did not demand such restrictions, it would be criticized as discriminatory and not pursuing the (newly defined) highest standard on control of enrichment and reprocessing (ENR) capabilities. In early 2012, Obama administration officials appeared to resolve the impasse, stating they would no longer require a no-enrichment pledge as a precondition for nuclear cooperation. Within months, though, the White House appeared to reverse its decision and placed the question into a (third) round of inter-agency review.

Meanwhile, Jordan was courted by a number of nuclear supplier states and international consortia that did not require pledges regarding enrichment plans for technology sharing.<sup>36</sup> Russia expressed interest in Jordanian nuclear development and moved to sign a NCA in May 2009, but this action seemed to have less foundation in strategic motives. Historically, the two states did not have a strong relationship; in the Middle East, Russia's main alliance is with Syria, while it holds somewhat more distant relationships with others such as Jordan and Saudi Arabia. Russia's signature of the Jordan NCA was accompanied by little fanfare and no rhetoric regarding the geostrategic value of the deal. The head of the Rosatom State Nuclear Energy Corporation, Sergei Kiriyenko, told the Novosti Russian news agency simply, "We intend to cooperate in building nuclear power plants ... and plan to build four plants in Jordan in the coming decades."<sup>37</sup>

Third, even though Japan and Jordan signed a MOU in 2009 for nuclear planning, infrastructure, training, safety, and regulation—and a nuclear cooperation agreement in 2010—this case may be the least well explained by strategic imperatives. That is, Japan has neither direct geostrategic interest in Jordan, nor a long-standing commitment to "shore up" Jordan's energy security vis-à-vis other states in the region. Japan has had little historical military-security involvement in the Middle East, providing only logistical support for US-led operations in the region in recent decades. To some degree, this is a function of Japan's preoccupation with Asian security issues, the Yoshida Doctrine (emphasizing domestic economic development and a reticent presence abroad), a constitutional and politically cultural commitment to pacifism, and limited engagement in international security concerns. While Japan has an interest in Middle East stability insofar as it affects oil supply, and has provided foreign aid and direct investment for numerous projects in the region, it remains dependent on US military-security influence to protect its broader interests. One might assume Japan would choose *not* to compete with international players on whom it relies for security. In sum, Japanese-Jordanian nuclear cooperation

seems an unlikely manifestation of strategic theories focused on enmity, alliances, or agreements as instruments to impose strategic costs on rivals.

### *Economic Competition*

The policies of supplier states toward Jordan may be more fully understood through the lens of economic competition. Here, it is important to contextualize the case within broader global trends: the Kingdom announced its intention to join the nuclear power club at the height of the nuclear renaissance, setting off a frenzy of negotiations and speculation in a defined competitive space.<sup>38</sup>

The United States and Jordan completed a MOU rapidly in 2007, and the JAEC subsequently engaged in multiple rounds of negotiations of MOUs with competitor suppliers as well as plans for formalized nuclear cooperation.<sup>39</sup> Jordan issued its official tender for bids for its first nuclear power reactor in 2011, and they soon received and evaluated seven bids from four different vendors. Throughout this period, though, Jordanian officials were quite vocal about cost concerns for the new program. Public disputes broke out on several occasions between the monarchy's chief nuclear negotiator, Khaled Touqan, chairman of JAEC and former minister of energy and mineral resources, and critics in the Jordanian parliament. Touqan maintained that the entire project would likely cost around \$7 billion; critics in parliament charged the nuclear power "experiment" might cost the Kingdom four or five times that amount.<sup>40</sup> Touqan characterized Jordan's move to nuclear power as an "historic decision," in which Jordan "faced three challenges: security, financing, and instability in the region." And he warned that the Jordanian parliament would not sign a contract "until they have really assessed and made sure none of these threats do exist."<sup>41</sup> Vendors appear to have taken these issues to heart: bids were framed as suppliers' best efforts to compete for contracts, and diplomats and corporate executives engaged in negotiations mindful of the potential market advantages of competitors.

US corporations were very interested in the Jordanian market. The United States, the world's first nuclear power, had a significant jump on the competition after World War II. With government support, US companies leapt out of the gate to become primary suppliers of nuclear technology assistance to client states. The United States negotiated dozens of NCAs over the years. In a three-year period between 1955 and 1958, for example, the United States signed NCAs with forty-one different states.<sup>42</sup> The 1980s was another growth period of agreements with developing states, reflecting a commercial drive to expand the US nuclear industry in foreign markets. A second wave of NCAs occurred in the late 1990s with developing states from the former communist bloc, such as Bulgaria, Romania, the Ukraine, and Kazakhstan.

However, the United States was less competitive in its bids to Jordan than one might expect; it was quite slow to adapt to some elements and strategies of their competitors. Indeed, critics charge that the Jordan case is symptomatic of the lack of a well-defined government strategy to support and promote nuclear industry efforts to compete globally. According to one study, the roots of these problems include bureaucratic struggles among relevant government agencies like the Department of Energy, Nuclear Regulatory

Commission, and Departments of Commerce and State, as well as a decline in domestic manufacturing capabilities.<sup>43</sup> Perhaps most critical, private companies are not receiving the types of relief and support they seek, such as liability protections for export agreements, placing these companies at a distinct competitive disadvantage.

This is not for lack of effort on the part of the nuclear industry: US companies are painfully aware of rivals in the marketplace, especially the advantages that state-owned industries enjoy, and they struggle to compete. Industry consortia such as the American Council on Global Nuclear Competitiveness (ACGNC) have lobbied the US government for greater liberalization of export regulations, as well as sectoral protections. They champion the goal of the “return of American nuclear leadership to the world through the emergence of an US-led global nuclear enterprise.”<sup>44</sup> In the case of Jordan, these same companies pressured the government to complete an agreement, but diplomats dragged their feet on the issue and failed to engage in competitive bidding for reasons including the administration’s insistence on a no-ENR pledge.

Meanwhile, Russia and Japan have been two of the more aggressive players in the competitive arena of the nuclear renaissance. The modern Russian nuclear energy complex had its foundations in the crash Soviet program that produced the country’s first bomb in 1949. During the Cold War, the primary market for Russian nuclear energy technology was communist client states, and the Soviet Union developed and shared a significant amount until the Chernobyl disaster of 1986. In contrast to the US model, the Soviet (and Russian) nuclear energy complex has always been a state-run enterprise. Soviet leaders saw potential advantages in refining nuclear technology at home as well as for export, and Soviet scientists advanced technologies at all stages of the nuclear fuel cycle.

In the 2000s, Russian President Vladimir Putin renewed his country’s commitment to compete in the civilian nuclear power market. Russia was very well positioned to compete in the international market: the country possessed about 40 percent of the world’s uranium enrichment capacity, exporting some \$3 billion worth of fuel a year. Its nuclear export business is driven by Rosatom, which announced in 2007 an ambitious plan for market expansion: a goal to export as many as sixty nuclear power plants in next two decades.<sup>45</sup>

One of Rosatom’s main competitive advantages is its ability to finance and build nuclear power plants in non-nuclear weapon states, to be delivered on a turnkey basis. These deals often include supply of all fuel and repatriation of spent fuel for the life of the plant. They offer a “build-own-operate” (BOO) model for plant construction, including state-backed loan financing of plants in foreign countries. Ownership is eventually sold to local companies, and operation of the plant to produce electricity for clients is provided on a contract basis. In 2009, officials announced that Russia’s drive for global market share had already been successful: foreign orders to build nuclear reactors had doubled over the previous two years and an order ledger for reactor construction projects around the world worth \$50 billion over the next decade had been established.<sup>46</sup> By 2012, Russian plant construction was underway in China, Vietnam, India, Iran, and Turkey; Russia was also pursuing new cooperation deals in at least seven other developing states.

News of the US-Jordanian MOU in 2007 appeared to spur Russian officials to action. They began negotiations that emphasized their competitive edge. First, Rosatom and its reactor export subsidiary, Atomstroyexport (ASE), offered potential clients “the complete

package" in the BOO reactor deals. This model offered financing, construction, maintenance, safety measures, and fuel for nuclear reactors. Second, as a state-owned company, Rosatom enjoys backing on critical issues of financing and liability. That is, Russian nuclear contractors ultimately have the support of their government, and liability issues that have bedeviled companies in capitalist systems were simply not a handicap for Russian firms. Russia also claimed the 1989 nuclear disaster at Chernobyl helped hone its technology and put Russian operations at the forefront of safety innovations. These advantages appeared helpful in creating a distinctive bid profile in a defined competitive space like Jordan.

During 2009–10, Russian officials were lobbying hard for the Jordan deal. They offered a 1,000 MW third-generation conventional reactor model that was the flagship of Rosatom export initiatives. When Jordan countered with concerns about the cost of new plants, they also reportedly entertained an asset swap deal—equal to up to 25,000 tons of yellowcake from its uranium ore reserves—in lieu of cash payment for the reactor project.<sup>47</sup> Finally, as Jordan's selection process winnowed down to the finals, Russian officials upped the ante by offering a deal for Atomstroyexport to build four additional new 1,200 MW units, beyond the tender to supply the country's first power reactor. This offer was similar to an agreement Russia had recently reached with Turkey, and it would help the Kingdom achieve its stated dream to transform itself from a net energy importer to net energy exporter. And in June 2012, Putin also made a high-profile visit to Jordan to meet with King Abdullah II and discuss issues including nuclear cooperation.

Japan's pursuit of a NCA with Jordan is also better understood through the economic imperative lens. Japan is a resource-poor nation that in the past has been buffeted by the winds of the international energy economy. Japan started a nuclear research program in the mid-1950s; in 1955, the Japanese parliament—the Diet—passed an Atomic Energy Basic Law, which strictly limited the use of nuclear technology to peaceful purposes. The government and industry devoted much more attention to nuclear power generation after the oil shocks of the 1970s, and this helped provide cheap electric power to fuel Japan's economic miracle.<sup>48</sup> Before the Fukushima crisis in 2011, Japan had fifty operational nuclear power plants that provided 30 percent of its electricity needs.

Japan first established NCAs with traditional allies including the United States, the United Kingdom, Canada, Australia, France, and the European Atomic Energy Community. The timing of Jordan's opening was fortuitous. The Japanese government had positioned nuclear exports as one of the pillars of its New Growth Strategy (adopted by its cabinet in June 2010) and began pursuing more NCAs during the nuclear renaissance. In October 2010, government officials helped launch a new consortium, JINED—the International Nuclear Energy Development of Japan Co., Ltd.—to heighten Japan's profile in international civilian nuclear market and focus its efforts to bid for power projects.<sup>49</sup>

In the case of Jordan, Japanese officials lobbied hard to achieve a nuclear cooperation agreement. They developed several commercial and marketing strategies to maximize potential gains. First and foremost, the Japanese focused on the quality of their exports and services. JINED and power companies emphasized that their work would build on the nation's technological strength and industrial power base on craftsmanship.<sup>50</sup> Second, Japanese firms sought out partnerships with experienced commercial nuclear enterprises around the world to increase their competitiveness. Japan's Mitsubishi Heavy

Industries teamed up with French-owned AREVA to bid on reactor construction and management. AREVA had established a strong track record on nuclear energy research and development projects in the Middle East.

The AREVA-Mitsubishi Industries bid for Jordanian nuclear plants was highly competitive. The consortium trumpeted its offer of advanced Generation III technologies in a new 1,000 MW reactor design. The AREVA standard design, a conventional 1,600 MW model, was much more expensive, so the company offered to customize a smaller model for Jordan and other new clients.<sup>51</sup> Second, the consortium bid was also affected by location plans for the reactor in Jordan. During negotiations, Jordanian officials determined that the location for the reactor should be moved further from the capital city, Amman, due to safety and environmental concerns. This required engineers in the bid to creatively redesign plans for coolant systems to best match the new location.<sup>52</sup> And it is notable that the negotiations with Jordan carried on during and after the Fukushima crisis of 2011, and corporate representatives even tried to leverage their “responsible” management of the situation, their resilience and lessons learned, in new rounds of negotiations.<sup>53</sup>

Japan and Jordan signed a NCA in September 2010, but the deal stalled in the Diet (partly due to strong anti-nuclear sentiments after the Fukushima disaster). Demonstrating a synergistic issue linkage, proponents of a nuclear export deal with Jordan used the prospect of securing lucrative bids to push forward ratification of a Japan-Jordan NCA in the parliament. They had valuable assistance in this effort from Jordanian leadership; JAEC Chairman Touqan publicly urged Japanese officials to endorse the NCA before the selection of successful bids for reactors. The AREVA-Mitsubishi consortium competed with Russian and Canadian firms to win contracts for plants worth billions of dollars. Touqan made a point of saying, “Jordan still believes Japan’s nuclear technologies are among the best in the world, despite the ongoing Fukushima nuclear crisis.”<sup>54</sup>

Finally, in 2011, Jordan shortlisted vendors and designs from the AREVA-Mitsubishi consortium, two different models from Russia’s Atomstroyexport, and the Atomic Energy Agency of Canada. While the original goal was to begin reactor construction in 2013 for operation by 2020, with a second plant online by 2025, Jordanian officials are now conducting a feasibility study for large-scale construction at a site east of Amman to begin by 2015.<sup>55</sup> Thus, in a short, three-year timespan, the Jordanian government signed NCAs with twelve different states on various aspects of its program, including Russia, Japan, France, Canada, the United Kingdom, South Korea, Spain, Italy, Romania, Turkey, China, and Argentina.<sup>56</sup>

## Vietnam and Nuclear Power

Vietnam joined the nuclear renaissance in the 2000s as a new client state with an interesting history. Vietnam relied primarily on hydroelectric, natural gas, and coal to fuel its rapid economic development in the late 20th century, but burgeoning demand generated government interest in nuclear energy. Vietnam was one of a number of Southeast Asian states—including Indonesia, Bangladesh, Thailand, and the Philippines—that announced aspirations for energy independence through nuclear power.

Vietnam formalized this commitment in the 2000s. The Vietnam Atomic Energy Commission (VAEC) spearheaded the initiative, and in 2007, government leaders approved a development plan to negotiate its first power reactor construction project with the goal of production by 2020, followed by the goal of a much larger scale of power production during the following decade. In 2008, the government passed a general law on nuclear energy, identified reactor construction sites along the coast, and projected at least a dozen nuclear power plants for sites in five different provinces. From the outset, though, the government also sought to maintain flexibility regarding its future intention, including the possibility that it would pursue enrichment of indigenous uranium.

### *Strategic Imperatives*

Vietnam's assets and strategic location on the South China Sea have made it an object of contest for centuries. The strategic lens appears to help explain early US engagement with Vietnam on the nuclear question. US diplomats lauded Vietnam's interest in "the responsible expansion of nuclear power through careful steps taken in cooperation with the United States, among other international partners, towards the development of the robust nuclear infrastructure."<sup>57</sup> Vietnam's adoption of an Atomic Energy Law in 2008, a legal framework for its nuclear infrastructure, and its signature of the IAEA Additional Protocol, showed it could serve as an important, pro-US voice in the region for both moderation of proliferation ambitions and peaceful settlement of conflicts.<sup>58</sup> In 2010, the United States signed a MOU with Vietnam to pursue civil nuclear cooperation, and the State Department declared this part of a larger strategy to "open the door for increased cooperation" between the two countries.<sup>59</sup>

However, the strategic imperatives model fails to explain the delays, unfavorable negotiating terms, special demands, and absence of a NCA following completion of the MOU. A partial source of this delay was (again) US policy debates over the appropriateness of signing agreements that do not include a "gold standard" restriction on enrichment and reprocessing. The US position has always been to try to limit the spread of sensitive nuclear technology, and it was firm in negotiations on the ENR pledge through at least the end of 2010. In response, Vietnamese officials drew the line on an enrichment ban, rejecting such restrictions on principle as a violation of sovereignty and Article IV rights under the NPT. Vietnamese leaders demonstrated their position by shifting their business to other states. Even though the White House hinted at flexibility on the matter with Vietnam, negotiators did not reach a final settlement.

Russia also has critical geostrategic interests in Vietnam. Indeed, the Soviet Union supported communist Vietnam and stepped in to provide the country with valuable early development assistance in the form of grants and loans after the Vietnam War. Vietnam became a transit hub for access to the Soviet far east, and the Soviet Union took over the large US naval base at Cam Ranh Bay in southern Vietnam. In 2001, the two states announced a comprehensive strategic partnership.

Russia is also linked to Vietnam on many matters of energy security. Soviet advisors helped restart the Da Lat research reactor and promoted Vietnamese scientific interest in civil nuclear power. Russian consultants have worked closely with the largest electric

power company in Vietnam, Vietnam Electricity (EVN), and promoted joint venture explorations for offshore oil and gas, as well as hydroelectric and geothermal plants. In the 1990s and 2000s, dozens of bilateral agreements were inked. Russian Foreign Minister Sergey Lavrov made multiple visits to Vietnam in the late 2000s, stressing the strategic partnership and cooperation “at the highest level” between the two nations. Vietnamese Foreign Minister Pham Gia Khiem described ties with Russia as “brotherly,” with an emphasis on trade and cooperation in many economic sectors. In 2010, then-Russian President Dmitry Medvedev made a personal pitch for an agreement during a state visit to Hanoi, linking nuclear cooperation to a broader strategic agreement including sales of advanced submarines and aircraft to the government.<sup>60</sup> Thus, the strategic lens appears to account well for Russian interests in Vietnam.

For its part, Japan has substantial geostrategic interests in Vietnam, though historically, relations between the two states have been uneven. Japanese forces invaded and occupied Vietnam during World War II. Relations with Vietnam were also complicated by the civil war in Cambodia and the rise of the Khmer Rouge. Today, Vietnam finds itself in the middle of a serious dispute between China and Japan over a group of islands and mineral and oil exploration rights in the sea. Japan has sought to counter Chinese influence in the region by engaging Vietnam and other countries in Indochina in regional conferences that explicitly excluded China.<sup>61</sup> Japan has provided hundreds of millions of dollars in foreign assistance to Vietnam, and it was an important influence on Vietnam’s move to economic liberalization in the 1980s and its entry into the Association of Southeast Asian Nations in 1995.<sup>62</sup>

### *Economic Competition*

While strategic imperatives appear to offer a measure of explanation of Japanese and Russian engagement with Vietnam, the policies of supplier states may be more fully understood through the lens of economic competition. The United States was quite willing to sign a MOU with Vietnam in 2010. Yet, while many other governments moved quickly to secure nuclear cooperation agreements with Vietnam—among them, France, Japan, Russia, and South Korea—US diplomats acted more slowly. This was not because they did not recognize the intensity of competition. Indeed, when it became clear in 2010 that firms from Russia, Japan, and elsewhere were rapidly closing deals with Vietnam, the United States dispatched its permanent representative to the IAEA, Glyn Davies, to Hanoi. Davies spoke publicly about the US intent to finalize a nuclear cooperation agreement and not be “squeezed out [of the competitive space] by the Russians and Japanese.” He maintained “there will be plenty of room for any number of partners to work with a dynamic, forward-looking country like Vietnam in the future and on the development of nuclear energy.” Davies added, “Of course, we believe that the US has much to offer in this area.”<sup>63</sup> In the end, though, this appeal was sidetracked by the no-enrichment clause demand as well as unresolved technical and legal issues.

In contrast, Russia was primed to seize the opportunity for economic gain through Vietnam’s nuclear power infrastructure. Russia and Vietnam had completed a NCA related to the Da Lat nuclear reactor in the 1980s, and they renewed and formalized their nuclear



cooperation again through a 2002 treaty. Medvedev's state visit to Hanoi in 2010 emphasized the importance of short- and long-term economic opportunities through partnership.<sup>64</sup> And in October 2010, Russia and Vietnam signed a deal for Atomstroyexport to build twin nuclear power reactors at Vietnam's first plant (Ninh Thuan 1), with the goal of bringing them online in 2020. Consistent with past practices, Rosatom would manage the project, with the Russian government willing to finance nearly 90 percent of the original construction. Russia also agreed to provide scientific training to Vietnamese engineers for long-term management of the plant.<sup>65</sup> Effectively, these initiatives can be seen as illustrations of both Russia's competitive edge and its keen awareness that it was operating in an environment of uncoordinated interdependence. To date, Rosatom, the Vietnamese government, and EVN have finalized deals for the construction of four nuclear plants in Vietnam.

Negotiations between Vietnam and Japan appear to demonstrate the contagion effects of economic competition. Having signed a contract for plants with Russia, Vietnamese officials seemed to have the upper hand to press Japan on terms for another assistance agreement. Le Doan Phac, VAEC deputy director general, asserted that the energy needs of a rapidly growing population, not to mention burgeoning commercial electricity, required nuclear technology agreements to meet its growth rates. He stated that the VAEC's goal was to achieve 11,000 MW, or roughly 8 percent of baseload electricity supply, by 2030. To get there, the VAEC established criteria for competitive bids including up-front financing and assistance in conducting feasibility studies for its new plants as well as "low-interest and preferential loans" from potential suppliers. It appears the VAEC was able to successfully leverage the terms of its NCA with Russia as a baseline for subsequent agreements, including demands for technology training and cooperation in spent fuel and radioactive waste management and treatment for the project, as well as supply of nuclear fuel for the whole life of the project.<sup>66</sup>

Japanese representatives seemed responsive to these demands and lobbied hard for a reactor deal in late 2010 and early 2011. Japan attempted to wrap the issue of nuclear cooperation into a larger package of resource development, including a project for advanced technology assistance for rare-earth metal exploration and development. Like Russia, Japan offered low interest loans to finance feasibility studies and plant construction through the Japan Bank of International Cooperation. Diplomats pledged additional billions in development assistance targeted to help build roads, ports, and other infrastructure to support nuclear power plants. Japanese firms also helped EVN conduct feasibility studies and design consulting contracts (pro bono services worth millions of dollars), and even signed on to assist Vietnam in revising its Atomic Energy Law to address liability issues and emergency response to nuclear accidents. Finally, under competitive pressures from the Russia deal, JINED offered to provide an unprecedented up-front financing and insurance deal for the project, worth up to 85 percent of the total cost, as well as training for at least 1,000 Vietnamese engineers and scientists in nuclear research and plant operations. In October 2011, Vietnamese Prime Minister Nguyen Tan Dung announced that Japan had won a bid to construct two nuclear reactors in Vietnam (Ninh Thuan 2), to come online by 2024.<sup>67</sup>

## Conclusion

This article has explored the significance of strategic imperatives and economic competition in shaping nuclear export policies. Both factors appear to offer a measure of explanation for the majority of case studies, but the competition model seems to add an important layer of context and motivation. Openings by the governments of Vietnam and Jordan to nuclear trade generated frenzied activities, with suppliers and clients, governments and corporations all engaged in negotiations on potentially lucrative deals. Interactions among suppliers and clients impacted other competitors' marketing strategies as well as government export policies.

Case studies confirm the importance of strategic relationships in helping to shape negotiations on peaceful nuclear cooperation. Nuclear supplier states with established ties to clients were very likely to attempt to negotiate cooperation agreements and share technology. Existing relationships were important foundations on which to build criteria for nuclear cooperation, and in several cases they seem to have facilitated negotiations as well as sped them along toward completion. For example, the foundation of US-Jordan relations were instrumental in rapid development of a MOU in 2007. And the "brotherly" relationship between Russia and Vietnam, sweetened by an accompanying agreement on conventional weapons transfers, clearly helped the two states more quickly find acceptable terms for the nuclear deal. It is also noteworthy that at no time did Russian or Japanese officials publicly challenge clients to provide additional guarantees or limitations on future plans (even regarding enrichment and reprocessing).

The cases also highlight the importance of economic competition. As negotiations for lucrative nuclear reactor deals proceeded, suppliers had to move to counteract the offers of their competitors. Policies that spread through competition appeared sometimes more "selective" than strategic in terms of pairings, negotiation offers, and the temporal ordering of deals. Indeed, both client states examined for this article experienced a veritable frenzy of competing offers of goods and services once they signed MOUs with major suppliers. In the case of Jordan's nuclear infrastructure, Russia was willing to offer it a plant using the BOO model for turnkey operation that included providing more than 90 percent of initial financing for operations. Japan reached out to the Middle East to actively compete for reactor deals, and JINED responded to the Russian bid by offering financing arrangements above 80 percent of cost in several instances. Each also offered state-of-the-art technologies in their nuclear plants. Vietnamese officials received offers from Rosatom for third-generation reactors, and the AREVA-Mitsubishi consortium responded by offering to custom-design a new, more affordable 1,000 MW reactor line. Meanwhile, the US government signed MOUs with Jordan and Vietnam early on (in 2007 and 2010, respectively), but corporations scrambled to try to offer competitive deals that included advanced technology, expanded consultations on nuclear safety, and technical information exchanges. In sum, economic competition among nuclear suppliers appears to be an important and overlooked motivation.

One of the more interesting questions to arise from this assessment is how and why the United States seemed to be "left in the dust" in negotiating nuclear cooperation agreements with Jordan and Vietnam. The competing literatures offer different

perspectives on this question. For example, a strict strategic argument would suggest that because the United States had fewer strong ties with distant Vietnam and Jordan (and had, in fact, fought them or aided their rivals in the past), the United States would be less likely to compete or provide generous terms for nuclear cooperation. Yet, US firms and government representatives did lobby both client states for lucrative deals. Another of Kroenig's strategic imperative arguments was that superpowers like the United States would be less likely to transfer sensitive nuclear technology to client states for fear of changing the balance of power. This assertion of rational, power-maximizing behavior does seem to ring true in the story of the US position on no-ENR pledges for peaceful nuclear cooperation agreements. But an additional layer of explanation for the US lack of competitiveness may be found through the lens of economic competition. US government negotiators and corporations were simply unable to compete with large, state-run consortia that could offer excellent financing rates and liability law protection. They could not keep up with the offers and counter-offers by Japanese and Russian firms that included a creative range of antes—from turnkey construction models and waste management plans to innovations in coolant systems, offers to retool entire production lines, and asset swaps in lieu of cash. Perhaps ironically, these cases illustrate the degree to which the United States was handicapped in a competitive marketplace that it had essentially created and dominated a few decades earlier.

Finally, this article identifies several avenues for further research. First, a broader investigation of other supplier-client dyads would allow exploration of questions about the impact of differences between supplier states that might make them more or less likely to be influenced by competition dynamics. Further study might also examine whether there are scope conditions under which we could expect strategic factors or economic factors to be more prevalent in shaping nuclear cooperation patterns. Additional study of competitor bids by other major players such as France and its government-owned AREVA or South Korea as an emerging supplier state might deepen our understanding of the power of competition.<sup>68</sup> The few cases examined here, where commercial gain appeared to be the dominant motive, raise questions about how economic competition dynamics may cause cooperation where it might otherwise not have existed with few or no strategic interests at play, a potentially important corrective to over-generalizations in the strategic imperatives literature. And third, this article highlights ways that principled restraint may hamper or delay nuclear cooperation, a dynamic not well accounted for in rational or neoliberal models of cooperation. In sum, further exploration of intense, competitive marketplace dynamics in the nuclear renaissance raises important questions for international relations theorists and policy makers alike.

## ACKNOWLEDGMENTS

The author received helpful commentary on development of this manuscript from Matthew Fuhrmann, Jonathan Pearl, Juliet Kaarbo, Jim Wirtz, Jim Keeley, John Baylis, Imad El-Anis, and Jeffrey Knopf. Feedback from anonymous reviewers for the *Nonproliferation Review* also helped refine several critical arguments. Some research for this article was

completed while the author served as a visiting scholar in the Institute for Security and Conflict Studies at the Elliott School of International Affairs, George Washington University, and thanks go to director Charles Glaser and his colleagues for their advice and support. An earlier version of this paper was presented at the Monterey Strategy Seminar at the Naval Postgraduate School, in Monterey, California, in the fall of 2011.

## NOTES

1. Matthew Fuhrmann, "Spreading Temptation: Proliferation and Peaceful Nuclear Cooperation Agreements," *International Security* 34 (Summer 2009), pp. 7-41; Matthew Fuhrmann, *Atomic Assistance: How "Atoms for Peace" Programs Cause Nuclear Insecurity* (Ithaca, NY: Cornell University Press, 2012); Matthew Kroenig, "Exporting the Bomb: Why States Provide Sensitive Nuclear Assistance," *American Political Science Review* 103 (February 2009), pp. 113-33.
2. Matthew Fuhrmann, "Nuclear Suppliers and the Renaissance in Nuclear Power," in Adam Stulberg and Matthew Fuhrmann, eds., *The Nuclear Renaissance and International Security* (Stanford, CA: Stanford University Press, 2013), p. 5; see also Douglas M. Stinnett, Bryan R. Early, Cale Horne, and Johannes Karreth, "Complying by Denying: Explaining Why States Develop Nonproliferation Export Controls," *International Studies Perspectives* 12 (August 2011), pp. 308-26.
3. Fred McGoldrick, "Nuclear Trade Controls: Minding the Gaps," Report of the CSIS Proliferation Prevention Program, Center for Strategic and International Studies, January 2013, <[http://csis.org/files/publication/130122\\_McGoldrick\\_NuclearTradeControls\\_Web.pdf](http://csis.org/files/publication/130122_McGoldrick_NuclearTradeControls_Web.pdf)>.
4. Scott D. Sagan, "Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb," *International Security* 21 (Winter 1996-97), pp. 54-86.
5. Stephen M. Meyer, *The Dynamics of Nuclear Proliferation* (Chicago: University of Chicago Press, 1984); Jacques E.C. Hymans, *The Psychology of Nuclear Proliferation: Identity, Emotions, and Foreign Policy* (Cambridge: Cambridge University Press, 2006); William C. Potter and Gaukhar Mukatzhanova, eds., *Forecasting Nuclear Proliferation in the 21st Century: Volume 2, A Comparative Perspective* (Palo Alto, CA: Stanford University Press, 2010); Etel Solingen, *Nuclear Logics: Contrasting Paths in East Asia and the Middle East* (Princeton, NJ: Princeton University Press, 2007).
6. Sonali Singh and Christopher Way, "The Correlates of Nuclear Proliferation: A Quantitative Test," *Journal of Conflict Resolution* 48 (December 2004), pp. 859-85; see also Dong-Joon Jo and Erik Gartzke, "Determinants of Nuclear Weapons Proliferation," *Journal of Conflict Resolution* 51 (February 2007), pp. 1-28.
7. Fuhrmann, "Spreading Temptation," p. 9; Matthew Kroenig, "Importing the Bomb: Sensitive Nuclear Assistance and Nuclear Proliferation," *Journal of Conflict Resolution* 53 (April 2009), p. 165.
8. Kroenig, "Exporting the Bomb," p. 117; See also Matthew Kroenig, *Exporting the Bomb: Technology Transfer and the Spread of Nuclear Weapons* (Ithaca, NY: Cornell University Press, 2010).
9. Kroenig, *Exporting the Bomb*; Jo and Gartzke, "Determinants of Nuclear Weapons Proliferation."
10. Fuhrmann, "Spreading Temptation," p. 8.
11. *Ibid.*, p. 10.
12. See, for example, William C. Potter ed., *International Nuclear Trade and Nonproliferation* (Lexington, MA: Lexington Books, 1990); Sheena Chestnut, "Illicit Activity and Proliferation," *International Security* 32 (Summer 2007), pp. 80-111; Matthew Kroenig, "Exporting the Bomb," p. 126.
13. Etel Solingen, *Nuclear Logics: Contrasting Paths in East Asia and the Middle East* (Princeton, NJ: Princeton University Press, 2007), p. 18; T.V. Paul, *Power Versus Prudence* (Montreal: McGill-Queen's University Press, 2000).
14. Matthew Fuhrmann, "Taking a Walk on the Supply Side: The Determinants of Civil Nuclear Cooperation," *Journal of Conflict Resolution* 53 (April 2009), p. 181-208.
15. David Strang, "Adding Social Structure to Diffusion Models: An Event History Framework," *Sociological Methods and Research* 19 (February 1991), p. 325.
16. Bronislaw Malinowski, *A Scientific Theory of Culture* (Chapel Hill: University of North Carolina Press, 1944), p. iii; George M. Thomas, John W. Meyer, Francisco O. Ramirez, and John Boli, *Institutional Structure: Constituting State, Society, and the Individual* (Newbury Park, CA: Sage Publications, 1987).

17. Mireya Solís, Barbara Stallings, and Saori N. Katada, eds., *Competitive Regionalism: FTA Diffusion in the Pacific Rim* (New York: Palgrave Macmillan, 2009); "Diffusion Theory and Knowledge Dissemination, Utilization, and Integration in Public Health," *Special Issue of Annual Review of Public Health* 30 (2009); Brian L. Pitcher, Robert L. Hamblin, and Jerry L. Miller, "The Diffusion of Collective Violence," *American Sociological Review* 43 (February 1978), pp. 23-35.
18. Adam Przeworski and Henry Teune, *The Logic of Comparative Social Inquiry* (New York: Wiley-Interscience, 1970), pp. 51-53.
19. Frank Dobbin, Beth A. Simmons, and Geoffrey Garrett, "The Global Diffusion of Public Policies: Social Construction, Coercion, Competition, or Learning?" *Annual Review of Sociology* 33 (Spring 2007), pp. 449-72; "See also Dietmar Braun and Fabrizio Gilardi, "Taking 'Galton's Problem' Seriously: Towards a Theory of Policy Diffusion," *Journal of Theoretical Politics* 18 (July 2006), pp. 298-322.
20. Covadonga Meseguer, "Policy Learning, Policy Diffusion, and the Making of a New Order," *Annals of the American Academy of Political and Social Science* 598 (March 2005), pp. 67-82; Beth A. Simmons and Zachary Elkins, "The Globalization of Liberalization: Policy Diffusion in the International Political Economy," *American Political Science Review* 98 (February 2004), pp. 171-89.
21. Robert O. Keohane and Helen V. Milner, eds., *Internationalization and Domestic Politics* (Cambridge: Cambridge University Press, 1996).
22. Beth A. Simmons and Zachary Elkins, "On Waves, Clusters, and Diffusion: A Conceptual Framework," *Annals of the American Academy of Political and Social Science* 598 (March 2005), pp. 23-51.
23. Simmons and Elkins, "The Globalization of Liberalization," pp. 171-72; See also Zachary Elkins, Andrew T. Guzman, and Beth A. Simmons, "Competing for Capital: The Diffusion of Bilateral Investment Treaties, 1960-2000," *International Organization* 60 (October 2006), pp. 811-46; Fabrizio Gilardi, "Who Learns from What in Policy Diffusion Processes?," *American Journal of Political Science* 54 (July 2010), p. 653; Mireya Solís and Saori N. Katada, "Understanding East Asian Cross-Regionalism: An Analytical Framework," *Pacific Affairs* 80 (Summer 2007), pp. 229-58; Meseguer, "Policy Learning, Policy Diffusion, and the Making of a New Order."
24. Beth A. Simmons, Frank Dobbin, and Geoffrey Garrett, "Introduction: The International Diffusion of Liberalism," *International Organization* 60 (Autumn 2006), p. 790; Braun and Gilardi, "Taking 'Galton's Problem' Seriously," p. 300.
25. Kees Van Kersbergen and Bertjan Verbeek, "The Politics of International Norms," *European Journal of International Relations* 13 (June 2007), pp. 217-38.
26. *Ibid.*, p. 889.
27. Alexander George and Andrew Bennett, *Case Studies and Theory Development in the Social Sciences* (Cambridge, MA: MIT Press, 2004).
28. On the challenge of trade with developing states and maintaining nonproliferation order, see Megan Garcia, "Global Swing States and the Non-Proliferation Order," Working Paper for the German Marshall Fund and the Center for New American Security (Washington, DC: German Marshall Fund of the United States, 2012).
29. Richard M. Price, *The Chemical Weapons Taboo* (Ithaca, NY: Cornell University Press, 1997), p. 10.
30. Peter Crail and Jessica Lasky-Fink, "Middle Eastern States Seeking Nuclear Power," Arms Control Association, May 2008, <[www.armscontrol.org/print/2993](http://www.armscontrol.org/print/2993)>.
31. Yossi Beilin, "Let Jordan Enrich Its Own Uranium," *New York Times*, June 27, 2010, <[www.nytimes.com/2010/06/28/opinion/28beilin.html](http://www.nytimes.com/2010/06/28/opinion/28beilin.html)>.
32. Recently, Jordan's diplomatic stance was rewarded with an appointment to the IAEA's influential Board of Governors.
33. Jack Caravelli, *Beyond Sand and Oil: The Nuclear Middle East* (Santa Barbara, CA: Greenwood Publishing Group, 2011).
34. It should be noted that the US Nuclear Regulatory Commission has negotiated agreements (technically termed "arrangements") for low-level cooperation, technical information exchanges, and advising on nuclear regulatory matters with both the Jordan Nuclear Regulatory Commission and the Vietnam Agency for Radiation and Nuclear Safety (VARANS) in recent years; Paul K. Kerr, Mark Holt, and Mary Beth Nikitin, "Nuclear Energy Cooperation with Foreign Countries: Issues for Congress," Congressional Research Service Report, July 11, 2011, <[www.fas.org/sgp/crs/nuke/R41910.pdf](http://www.fas.org/sgp/crs/nuke/R41910.pdf)>; US Department of State, "Arrangement Between the United States Nuclear Regulatory Commission and

- the Jordan Nuclear Regulatory Commission for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters," Document #2012-0176, September 20, 2012, <<http://www.state.gov/documents/organization/206367.pdf>>.
35. Sharon Squassoni, prepared statement before the House Foreign Affairs Committee, "Nuclear Cooperation and Nonproliferation: Reconciling Commerce and Security," 111th Cong., 2nd sess., September 24, 2010, p. 8, <[http://csis.org/files/ts100923\\_Squassoni.pdf](http://csis.org/files/ts100923_Squassoni.pdf)>; Jonathan Pearl, "Charting a smarter course for a US-Jordan nuclear deal," *Bulletin of the Atomic Scientists*, October 25, 2010, <[www.thebulletin.org/web-edition/op-eds/charting-smarter-course-us-jordan-nuclear-deal](http://www.thebulletin.org/web-edition/op-eds/charting-smarter-course-us-jordan-nuclear-deal)>; Imad El-Anis, "The Political Economy of Energy Security and Nuclear Energy in Jordan," *Central European Journal of International Security Studies* 6 (February 2012), pp. 23-45.
  36. Beilin, "Let Jordan Enrich Its Own Uranium."
  37. "Russia, Jordan Sign Nuclear Cooperation Agreement," *Haaretz*, May 23, 2009, <[www.haaretz.com/news/russia-jordan-sign-nuclear-cooperation-agreement-1.276562](http://www.haaretz.com/news/russia-jordan-sign-nuclear-cooperation-agreement-1.276562)>.
  38. Government Accountability Office, "Nuclear Commerce: Government-wide Strategy Could Help Increase Commercial Benefits from U.S. Nuclear Cooperation Agreements with Other Countries," Report to the Committee on Foreign Affairs, House of Representatives, GAO-11-36, November 2010, <[www.gao.gov/assets/320/311924.pdf](http://www.gao.gov/assets/320/311924.pdf)>.
  39. "Emerging Nuclear Energy Countries," June 25, 2012, <[www.world-nuclear.org/info/inf102.html](http://www.world-nuclear.org/info/inf102.html)>.
  40. Taylor Luck, "Jordan Enters Talks with Russian, French Firms over Nuclear Reactor," April 29, 2012, <<http://jordantimes.com/jordan-enters-talks-with-russian-french-firms-over-nuclear-reactor>>.
  41. Quoted in an interview with Nuclear Export Controls blog, January 12, 2012, <<http://nuclearexportcontrols.blogspot.com/2012/01/khaled-touqan-jordan-no-nuclear-reactor.html>>.
  42. James F. Keeley, "A List of Bilateral Civilian Nuclear-Cooperation Agreements," Vol. 5, University of Calgary, 2009, <[http://dspace.ucalgary.ca/bitstream/1880/47373/11/Treaty\\_List\\_Volume\\_05.pdf](http://dspace.ucalgary.ca/bitstream/1880/47373/11/Treaty_List_Volume_05.pdf)>.
  43. Government Accountability Office, "Nuclear Commerce: Government-wide Strategy Could Help Increase Commercial Benefits from US Nuclear Cooperation Agreements with Other Countries."
  44. American Council on Global Nuclear Competitiveness, "Mission and Overview," <<http://archive.is/ycA1U>>.
  45. Fred Weir, "Russia Plans Big Nuclear Expansion," *Christian Science Monitor*, July 17, 2007, <[www.csmonitor.com/2007/0717/p01s04-woeu.html](http://www.csmonitor.com/2007/0717/p01s04-woeu.html)>.
  46. "Heavy Manufacturing of Nuclear Power Plants," World Nuclear Association, August 2013, <[www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Power-Reactors/Heavy-Manufacturing-of-Power-Plants/](http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Power-Reactors/Heavy-Manufacturing-of-Power-Plants/)>.
  47. Dan Yurman, "Update on Jordan's Nuclear Program," Idaho Samizdat: Nuke Notes Blog, June 7, 2012, <<http://djsrv.blogspot.com/2012/06/update-on-jordans-nuclear-program.html>>.
  48. Etel Solingen, "The Perils of Prediction: Japan's Once and Future Nuclear Status," in Potter and Mukhatzhanova, eds., *Forecasting Nuclear Proliferation in the 21st Century, Volume 2*, pp. 131-57.
  49. It is perhaps ironic that Ichiro Takekuro of the Tokyo Electric Power Company was named president of JINED just months before the Fukushima disaster.
  50. Takuya Hattori, President, Japan Atomic Industrial Forum, Inc., "Welcoming Four Nuclear Cooperation Agreements," January 30, 2012; "Vietnam Looking to Expand Nuclear Cooperation to Japan and US," *Platts Nucleonics Week* 51, September 30, 2010, <[https://online.platts.com/PPS/P=m&e=1286398459931.3502121332992842945/NW\\_20100930.xml?artnum=c0dc3d75f-04f9-4c7b-be12-ca16f11bc888\\_7](https://online.platts.com/PPS/P=m&e=1286398459931.3502121332992842945/NW_20100930.xml?artnum=c0dc3d75f-04f9-4c7b-be12-ca16f11bc888_7)>.
  51. Yurman, "Update on Jordan's Nuclear Program."
  52. Tsutomu Ishiai, "Jordan's First Nuclear Reactor Could Be Delayed by Syrian Conflict," *Asahi Shimbun*, May 16, 2012, <<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201205160022>>.
  53. As of late 2013, Japan is negotiating nuclear agreements with the United Arab Emirates, India, South Africa, and Turkey.
  54. "Jordan urges Diet to ratify nuclear pact," *Japan Times*, October 23, 2011, <[info.japantimes.co.jp/text/nn20111023a2.html](http://info.japantimes.co.jp/text/nn20111023a2.html)>.
  55. Taylor Luck, "Central Badia Residents Denounce Nuclear Reactor Plans," *Jordan Times*, November 9, 2013 <<http://jordantimes.com/central-badia-residents-denounce-nuclear-reactor-plans>>.
  56. In March 2010, a South Korean consortium (Korean Atomic Energy Research Institute and Daewoo) won a contract to build a research reactor at Jordan University for Science and Technology by 2015;

- Taylor Luck, "Jordan to Break Ground on First Reactor 'By Year's End'," *Jordan Times*, June 19, 2012, <<http://jordantimes.com/jordan-to-break-ground-on-first-reactor-by-years-end>>.
57. "USA and Vietnam Agree to Nuclear Cooperation," *World Nuclear News*, March 31, 2010, <[www.world-nuclear-news.org/NP-USA\\_and\\_Vietnam\\_agree\\_to\\_nuclear\\_cooperation-3103104.html](http://www.world-nuclear-news.org/NP-USA_and_Vietnam_agree_to_nuclear_cooperation-3103104.html)>.
  58. Doan Phac Le, "Vietnam's Nuclear Power Development Plan: Challenges and Preparation Work for the First Nuclear Power Projects, INPRO SMR Forum," October, 2011.
  59. "USA and Vietnam Agree to Nuclear Cooperation."
  60. Agence France Presse, "Russia Gets Vietnam's First Nuclear Power Deal," February 9, 2010, <[www.asiaone.com/News/AsiaOne+News/World/Story/A1Story20100209-197685.html](http://www.asiaone.com/News/AsiaOne+News/World/Story/A1Story20100209-197685.html)>.
  61. Michael Yahuda, *The International Politics of the Asia-Pacific, 1945-1995* (New York: Routledge, 1996).
  62. Masaya Shiraiishi, *Japanese Relations with Vietnam, 1951-1987* (Ithaca, NY: Southeast Asia Program, Cornell University, 1990); Keiko Hirata, "Japan as a Reactive State? Analyzing the Case of Japan-Vietnam Relations," *Japanese Studies* 18 (April 1998), pp. 41-58.
  63. Ben Bland, "Vietnam: Going Nuclear with US Help," *Financial Times*, December 9, 2010, <<http://blogs.ft.com/beyond-brics/2010/12/09/vietnam-going-nuclear>>.
  64. Agence France Presse, "Russia Gets Vietnam's First Nuclear Power Deal."
  65. John Daly, "Never Mind Fukushima—Vietnam to Embrace Nuclear Power," *Oilprice.com*, March 10, 2013, <<http://oilprice.com/Alternative-Energy/Nuclear-Power/Never-Mind-Fukushima-Vietnam-to-Embrace-Nuclear-Power.html>>.
  66. Le Doan Phac, Deputy Director General of the Vietnam Atomic Energy Agency, "Presentation to the INPRO Dialogue Forum on Nuclear Energy Innovations: Common User Considerations for Small and Medium-Sized Nuclear Power Reactors," Vienna, Austria, October 10-14, 2011, <[www.iaea.org/INPRO/4th\\_Dialogue\\_Forum/AGENDA\\_DF\\_Drivers.pdf](http://www.iaea.org/INPRO/4th_Dialogue_Forum/AGENDA_DF_Drivers.pdf)>.
  67. "Impetus for Japan-Vietnam Reactor Deal," July 5, 2013, *World Nuclear News*, <[www.world-nuclear-news.org/NN\\_Impetus\\_for\\_Japan\\_Vietnam\\_reactor\\_deal\\_0506131.html](http://www.world-nuclear-news.org/NN_Impetus_for_Japan_Vietnam_reactor_deal_0506131.html)>.
  68. Mycle Schneider, *Nuclear France Abroad: History, Status, and Prospects of French Nuclear Activities in Foreign Countries*, Paper for the Centre for International Governance Innovation in Waterloo, Ontario, Canada, May 2009, p. 6; See also Michelle Smith and Charles D. Ferguson, "France's Nuclear Diplomacy," *International Herald Tribune*, March 11, 2008, <[www.cfr.org/france/frances-nuclear-diplomacy/p15707](http://www.cfr.org/france/frances-nuclear-diplomacy/p15707)>.